

US EPA ARCHIVE DOCUMENT

4. *Bt* Sweet Corn Plant-Pesticides

In 1998, EPA approved the registration of Novartis' Cry1A(b) (*Bt*11) sweet corn. Major pests controlled are European corn borer (ECB), corn earworm (CEW), and fall armyworm (FAW). Approximately 742,000 acres of sweet corn is grown in the United States, including processed and fresh corn.

Top States Growing Sweet Corn
Acres Planted in 1999

State	Processed	Fresh	Total Sweet Corn
Minnesota	127,400	0	127,400
Wisconsin	107,100	8,900	116,000
Washington	99,400	2,100	101,500
New York	33,100	35,900	69,000
Oregon	44,200	6,900	51,100
Florida	0	38,900	38,900
California	0	31,000	31,000
Illinois	16,600	7,600	24,200
Pennsylvania	2,800	20,800	23,600
Georgia	0	22,000	22,000
Ohio	0	17,200	17,200
Idaho	15,800	0	15,800
Michigan	0	11,500	11,500
New Jersey	0	10,500	10,500
Selected States	446,400	213,300	659,700

Source: NASS, 2000

a. Potential to Replace Chemical Insecticides

Recent commercial field data studies for *Bt* sweet corn submitted by Novartis suggest the potential to achieve equivalent yields to traditional varieties while reducing the quantity of insecticides used to control these pests. According to NASS data, about 3.3 million acre treatments are applied annually to sweet corn. Based on the pest complex being targeted, the potential market for *Bt* corn is 2.0 million acres, or 60% of total acre treatments (Doane, 1998). The major chemical insecticide alternatives are cyhalothrin-lambda, permethrin, and methomyl with esfenvalerate, carbaryl, chlorpyrifos, cyfluthrin, and methyl parathion. *Bt* microbial sprays are used to a lesser extent. (Doane, 1998).

b. Benefits for Sweet Corn

The majority of sweet corn acres are planted to processed corn while the value per acre of fresh corn is over 3 times the market value of processed corn.

Year	1997	1998	1999
	<u>Processed</u>		
Planted Acres	478,900	486,400	473,400
Value (\$000's)	250,329	238,748	234,448
Value/acre	522.72	490.85	495.24
	<u>Fresh</u>		
Planted Acres	254,900	255,700	268,300
Value (\$000's)	418,617	452,410	458,632
Value/acre	1,642.28	1,769.30	1,709.40
	<u>Total</u>		
Planted Acres	733,800	742,100	741,700
Value (\$000's)	668,946	691,158	693,080
Value/acre	911.62	931.35	934.45

Source: NASS, 2000

On average, sweet corn is treated 5.5 times per year: 4.3 times for processed corn and 8.6 times for sweet, though the variability is quite significant among states.

Sweet Corn Insecticide treatments, 1998
(In thousands of acres)

State	<u>Fresh</u>		
	Planted	Treatments	Number of times/year
California	31.0	389.4	12.56
Florida	38.9	657.6	16.90
Georgia	22.0	115.8	5.26
Illinois	7.6	30.3	3.99
Michigan	11.5	50.4	4.39
New Jersey	10.5	82.2	7.83
New York	35.9	136.2	3.79
Oregon	6.9	5.8	0.84
Washington	2.1	11.3	5.40
Wisconsin	8.9	36.7	4.12
Total for top states	175.3	1,479.0	8.65

Source: NASS, USDA 2000

The simple simulation model for sweet corn shows an average net benefit/acre of \$3.55 for processed corn and \$5.75 for fresh corn. Upper limits benefits for sweet corn are based on savings from reduced insecticide applications. An upper limit application savings of \$45/acre is based on 9 applications per year, 60% that target *Bt* pests, and a cost per acre of \$8.25 (Doane, 1998). The source for market share estimates is USDA's Pest Management Practices 1999 summary. The estimate of 4% of vegetables in 1999 were planted with genetically modified seed to resist insects. Given market share of 4% (USDA), seed premium cost of \$30/acre (personal communication: Warnick, Debra. , Novartis Seeds, Inc), upper limit benefits of \$45/acre, upper limit *Bt* specific costs are estimated to be \$58/acre (which is 6.2% of the average value per acre grown in 1999). Net benefits are \$5.38/acre.

State	Processed Planted	Treatments	Number of times/year
Minnesota	127	717.9	5.64
New York	33	196.7	5.94
Oregon	44	104.9	2.37
Washington	99	299.3	3.01
Wisconsin	107	457.0	4.27
Total for top states	411	1,776	4.32
All Sweet Corn	587	3,255	5.61

Source: NASS, USDA 2000

The average *Bt* sweet corn user must cover the seed cost premium, and if benefits are mainly to reduce cost, then use reduction can be deduced from the average benefits plus seed cost premium divided by the chemical cost per acre. At a cost per treatment of \$8.25 and average benefit of \$35.38/acre, the use reduction of 4.3 treatments per year. Applied to the 30,000 acres treated with plant pesticides, total use reduction is estimated to be 127,000 in 1999.

Summary of Benefits for Sweet Corn, 1999

Per acre values, national acres

Net Benefits	\$5.38
<i>Bt</i> seed premium	\$30
Upper Limits:	
<i>Bt</i> specific costs	58
<i>Bt</i> seed benefits	45
National <i>Bt</i> acres planted	30,000
Savings (treatments/acre)	4.3
National use reduction	127,000

Source: EPA estimates